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Review Article

COMPREHENSIVE REVIEW OF *KRIMIGHNA* DRUGS MENTIONED IN THE AYURVEDIC PHARMACOPOEIA OF INDIA

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ABSTRACT

Ayurveda is the science of life having wide description of *Krimighna dravya* in its literature. Ayurvedic pharmacopeia of India published by the Ministry of AYUSH is a monograph of single drugs; which is very popular for all stack holder of Ayush system of medicines. This article details the review of single drugs mentioned in API part I (Vol I to VI) and their screening for *Krimighna* (antimicrobial) properties. Present article also aims for validating classical fact with published scientific research work. Authors searched 54 drugs out of 519 single drugs described in the API & it was found most of Ayurvedic *Krimighnadravya* were recognized for having antimicrobial property which was established through various Preclinical & clinical work carried out by the scientific community. Authors collected data with references to validate API drugs having antimicrobial property. All screened content can be taken for various high-tech research work by various students in MD, PhD or in the various other project of CSIR, DST, EMR project of CCRAS for further development of new drugs and conversion of available drugs to latest dosage form.

KEYWORDS: Ayurveda, *Krimighna*, Antimicrobial, API (Ayurvedic Pharmacopeia of India).

INTRODUCTION

Science is the intellectual process for using all of the mental and physical resources available. It helps to understand, predict quantify &explain normal as well as bizarre phenomena. Thus the scientific approach to understand anything involves observation, measurement of entities that can be quantified. The theories developed after repeated observations become the fundamentals of any science which are possible only after meticulous research. The therapeutic agents that keep the body fit and increase its capacity to combat disease are termed as drugs. There has been constant research in drug development in order to meet the demands of the present era. An urge to soothe the sufferings, is as old as the urge for the secured life. The oriental thinking found the path to mitigate the sufferings - be it physical, mental or spiritual in the form of science of life, i.e. Ayurveda.

Ayurveda is the world's oldest Indian holistic healthcare system. Ayurveda is a complete medical science with holistic approach. It aims to integrate and balance the body, mind and spirit. Thus, it is the art of living in harmony with nature. The word Ayurveda is derived from the Sanskrit word composed of two basionyms: 'ayur'-life and 'Veda'[1]- science/ knowledge, it is defined as the science of life and also as knowledge of life.

Concept of *Krimi* in Ayurveda[2]: There are some indirect references in Vedas for microbes and infectious diseases in the name of *Krimi* & *Krimi Rogas*. *Krimi* are thought to be the causative factors of a number of diseases. (*Atharvaveda* 2/32/6). These Visible or invisible minute organisms (*Krimi*) that affect on living & non living things of biosphere are described very efficiently in Ayurveda. The *Krimi* is a broad term which includes all types of worms and microbes. Ancient *Acharyas* were well aware regarding the presence of the microorganisms (*Krimi*), that may be pathogenic or non-pathogenic. All *Acharyas* described *Krimi*, with classification, symptoms and treatment.

Krimi

The word *Krimi* is derived from the root word "Kramana"[3] which means attacking, overcoming, surpassing. In Ayurveda, *Krimi* itself is considered as disease, which enter the body of immunocompromised individuals who indulges in taking unwholesome food, incompatible food, those who avoid physical exercise and those who sleep during day time and lack of cleanliness which in turn make body physiologically weak and reduces resistance of individuals thus create an environment for the attack of *Krimi* [4] (microorganism).

Classification of Krimi:[5,6] Several types of *Krimi* under various headings are described in Ayurvedic literature & Veda. In brief, these *Krimi* can be categorized as follows:

i) *Drushta* (visible through naked eyes) and *Adrushta Krimi* (invisible through naked eyes).
ii) *Bahya* (external) and *Abhyantara Krimi* (internal).
iii) *Purishaja* (faeces), *Shleshmaja* (phlegm), *Malaja* (unwholesome environment) and *Shonitaja Krimi* (blood).

***Krimis* in relation to other Diseases**

Krimis in relation to other Diseases, *Krimi* are not only responsible for the causation of *Krimiroga*, but also liable to cause many diseases as per Ayurveda. *Krimi's* are basically the etiogenic factors for *Krimidanta, Nasakrimi*, *Karnakrimi*, and other such diseases. *Krimi* are said as minute and of different shapes and colours. They affect various parts of the body causing abnormalities of that organs and systems. Some of the *Krimi* are visible to the naked eyes while some of them are not visible. Thus they can be considered as macro and micro forms of organisms. Microorganism mentioned in modern literature can be included heading of *Krimi*.

Microbe is a term for tiny creatures that individually are too small to be seen with the unaided eye. Microbes include bacteria**,** archaea**,** fungi and protists. Archaea are bacteria-like creatures that have some traits not found in any true bacteria. Protists include primitive algae, amoebas, slime molds and protozoa. Virus are a major type of microbe, responsible for many infections, still in debate as to whether viruses can be considered living creatures or not. Among microorganisms there arevarious forms of organisms like bacteria, fungus, and protozoa[7].

Types of Bacteria[8]

There are seven main groups of bacteria, distinguished by their shape and the type of cell wall they possess. Four of the seven types make up the majority of all bacteria.

- Gram positive cocci, Gram negative cocci, Gram positive bacilli, Gram negative bacilli. Cocci are spherical cells, bacilli are rod-shaped. Bacteria of either shape that have thick cell walls are termed gram positive because of the way they take up the Gram stain. Those with thin cell walls are termed gram negative.

Types of Fungi [9]

- Basidiomycota, Ascomycota, Neocallimastigomycota, Blastocladiomycota, Glomeromycota, Chytridiomycota, Microsporidia.

Protists include plant like protists which include different algae golden, fire, green, brown, red, phytoplankton and animal like protest include protozoa, sarcodines, flagellates, sarcodines, sporozoans.[10]

Viruses are classified according to shape as Helical, isohedral, prolate, envelope.[11]

There are various individual herbs mentioned under Ayurvedic literature which work against *Krimi* (microorganisms), and in present era scientific validation of their antimicrobial activity is available through various tests.

General Methodology to assess antimicrobial activity of an herbal drug:

Anti microbial studies[12]

1. Diffusion test

2. Dilution test

1) Diffusion test: Diffusion consists of two method i.e. Agar well diffusion, Agar disc diffusion.

a) Agar well diffusion

The Agar diffusion assay is one method for quantifying the ability of antibiotics, to inhibit microbial growth against test drug. A known quantity of micro-organism is grown on agar plate. The well is bored with help of borer, standard drug and test drug of desired concentration is poured in well. If the organism are susceptible to a particular antibiotics oral test drug, an area of clearing zone where organism are not capable of growing will be noted i.e. called a zone of inhibition. If the compound is effective against an organism atcertain concentration, no colonies will grow and this is called the zone of inhibition. Ingeneral, larger zones correlate with smaller minimum inhibitory concentration (MIC) of antibiotic for that organism. Inhibition produced by the test is compared with that produced by known concentration of a reference compound.

b) Agar disc diffusion

It is same as the previous method instead of wells, the disc are placed in agar media(both standard and test drug disc) later zone of inhibition is noted. The disc should not beplaced closer than 24 mm in agar plate. Not more than 12 discs should be placed on a 150mm plate. The disc must be pressed down with forceps to ensure complete contact with theagar surface.

2) Dilution method: Here, serial dilution of the drug is prepared and inoculatedwith the test microbe. In the tube dilution method, serial dilutions of the drug in broth aretaken in tubes and a standardized suspension of the test microbe which is inoculated. Afterovernight incubation, the minimum inhibitory concentration (MIC) is read by noting thelowest concentration of the drug that inhibits growth.

About The Ayurvedic Pharmacopoeia of India (API)[13]

The Ayurvedic Pharmacopoeia of India (API) is an official compendium of standards for the quality of Ayurvedic drug and substances included therein (Drugs and cosmetics' Act 1940). The Part and volume consist of monographs on single drugs of the plant origin, their Pharmacognostical, chemical and their different standardization parameters including pharmacognostical, phytochemical and pharmacological standardization.

This article focus on all *Krimighna* dravya found in different volume of Ayurvedic pharmacopeia, Part I (single drugs), Volume I to VI and find out the drugs having *Krimighna* properties in their Gun dharma (there are 8 vol. of API, Part 1 (single drugs) and 3 Volumes of Part 2 (formulations).

While taking details survey for existing research wok for secondary data available in various web portals; authors found various in vitro & in vivo scientific research study work for its validation. All available details also were summarized in tabular form by the authors. That will definitely help to various stakeholders of AYUSH systems of medicines/research of various filed, academia & industries.

Medicinal plants mentioned in various PART & VOLUMES of API having *Krimighna* (anti microbial properties)

S.No.	Medicinal Plant Name	Botanical Name	Family Name	*Karma* (Action)	Ref. given in API (Page No.)	Research Lead
	API-I, Volume-I2001, Ist Edition					
1.	***Ajagandha***	*Gynandropsis Gynandra*	Capparidaceae	*Krimijit*	3	*Cleome gynandra* Linn extract prepared in four solvents, ethanolic extracts were found to possess highest antimicrobial activity against E.coli, Proteus Aeruginosa. Acetone and chloroform extracts showed moderate inhibitory potency and no inhibitory activity was observed when tested in the aqueous extract[14].
2.	***Aragvadha***	*Cassia Fistula*	Leguminosae	*Krimighna*	9	In the present study, the microbial activity of hydroalcohol and chloroform extracts of flowers of Cassia fistula Linn. (An ethno-medicinal plant) were evaluated for potential antimicrobial activity against medically important bacterial and fungal strains. The tested bacterial strains were S. aureus, S. pyogenes, E. coli, P. aeruginosa, and fungal strains were A. niger, A. clavatus, C. albicans. The antibacterial potential of the extracts were found to be dose dependent[15].
3.	**Arka**	*Calotropis Procera*	Asclepiadacae	*Krimighna*	11	The anti-microbial effect of ethanol, aqueous and chloroform extracts of leaf and latex of *Calotropis procera* on six bacteria namely, Escherichia coli, *Staphylococcus aureus, Staphylococcus albus, Streptococcus pyogenes, Streptococcus pneumoniae* and three fungi: *Aspergillus niger, Aspergillus flavus, Microsporium boulardii* and one yeast *Candida albicans* were determined using agar well diffusion and paper disk methods. The results revealed that ethanol was the best extractive solvent for antimicrobial properties of leaf and latex[16].
4.	***Bibhitika***	*Terminalia belerica*	Combretaceae	*Kriminasan*	26	The antimicrobial activity of crude and methanol extract of *Terminalia bellerica* dry fruit was tested by disc diffusion method, against 9 human microbial pathogens. Crude aqueous extract of dry fruit at 4 mg concentration showed zone of inhibition ranging from 15.5-28.0 mm. *S. aureus* was found to be highly susceptible forming highest zone of inhibition, suggesting that *T. bellerica* was strongly inhibitory towards this organism[17].
5.	***Haridra***	*Curcuma longa*	Zingiberaceae	*Krimighna*	46	The in vitro antimicrobial activity of different fractions obtained from rhizome of *Curcuma longa* was investigated against standard strain and clinical isolates of *Staphylococcus aureus*. The clinical isolates were found more sensitive for different fractions, than the standard strain of S. aureus[18].

6.	***Hingu***	*Ferula foetida*	Umbelliferae	*Krimighna*	50	The aqueous and ethanolic extract of *F. assa-foetida L.* lacked the inhibitory effect against the growth of *S. mutans* and *S. sanguis* bacteria. There was a significant difference among the inhibitory zones created by dissimilar concentrations of *Q. infectoria*[19].
7.	***Kampilla***	*Mallotus Philippinensis*	Eukphobiaceae	*Krimighna*	55	Bioassay of antimicrobial activity of hexane, chloroform and ethanol leaf extract showed significant activity against the human pathogens such as Streptococcus pneumoniae causing brain abscesses, pneumonia and septic arthritis, Proteusvulgaris, Pseudomonas aeruginosa causing urinary tract infections and septicaemia, Salmonellatyphi causing typhoid fever, Vibrio species causing diarrheal infections and the fungus Candida albicans[20].
8.	***Karanja***	*Pongamia pinnata*	Leguminosae	*Krimijit*	63	MIC of Pongamia pinnata L. leaf extract against Staphylococcus aureus. Comparison of optical density indicates that ethanolic extract is more effective than that of methanolic and aqueous extract[21].
9.	***Karvira***	*Nerium Indicum*	Apocynaceae	*Krimighna*	65	The roots of *Nerium oleander* yielded a new cardenolide, 12β-hydroxy-5β-carda-8,14,16,20(22)-tetraenolide. Biological screening of the compound revealed antibacterial and digoxin-like cardiac activities[22].
10.	***Khadir***	*Acacia catechu*	Leguminosae	*Krimighna*	70	Taxifolin the main constituent of Acacia catechu which possesses antifungal, antiviral, antibacterial, anti-inflammatory and anti-oxidant activity. Efforts were made to explore the antimicrobial activity of the plant material against six known clinical pathogens Escherichia coli, Listeria sp., P. auregenosa, Bacillus sp., and Staphylococcus aureus showed positive results[23].
11.	***Kulttha***	*Vigna Unquiculata*	Leguminosae	*Krimighna*	75	The crude plant extracts of vigna unquiculata demonstrated broad spectrum activity against all bacteria. The highest inhibitory zone was observed in leaf methanol extract of *A. indica* against *E. aerogenes* and *E. coli* flower methanol extract of *C. angustifolia* against *B. cereus* and leaf acetone extract of *G. sylvestre* against *B. cereus*[24].
12.	***Svetajiraka***	*Cuminum cyminum*	Umbelliferae	*Krimighna*	106	Ethanol extracts of seed of Cyminum cuminum were tested for antimicrobial activity in vitro by the microdilution method. Ethanol extract of seed exhibited antimicrobial activity against biofilm Escherichia coli[25].

13.	***Upakuncika***	*Nigella Sativa*	Ranunculaceae	*Krimighna*	119	The Methanolic extract and oil of *Nigella sativa* were found active against 38 and 35 multi-drug resistant strains respectively. Both the oil and Methanolic extract showed remarkable dose dependant antibacterial activity against the tested strains up to a dilution of 1:50 as evident from the zones of inhibition[26].
14.	***Vidanga***	*Embelia ribes*	Myrsinaceae	*Kriminashan*	123	Antimicrobial activity of *Embelia ribes* has been evaluated in vitro by employing different concentrations of seed extract. Among the four different bacteria tested, maximum inhibition zone was observed in Escherichia coli (1.32 cm) followed by *Pseudomonas aeruginosa and Bacilus subtilis* [27].
15.	***Yavani***	*Trachyspermum ammi*	Umbelliferae	*Krimighna*	129	Essential oil of *Trachyspermum ammi* obtained by hydrodistillation for 2.5-3 h using a Clevenger-type apparatus and the minimum inhibitory concentrations were determined to characterize the antimicrobial activities of this essential oil. The results showed E. coli isolates were resistance to 4 of the antibiotics including ceftazidime (50%) cefixime (41.6%), tetracyclin (75%), erythromycin (58.3%)[28].
	API-I, Volume-II,1999 IstEdition					
1.	***Jambu***	*Syzygium cuminii*	Myrtaceae	*Krimighna*	57	Alcoholic extract of *syzigium cuminii* show a remarkable activity against gram–negative bacteria and yeasts, including multi–resistant gram–negative strains. the differences in susceptibility patterns observed with the two methods may be explained by the differences in diffusibility of the extract in agar[29].
2.	***Paribhdra***	*Erythrina indica*	Fabaceae	*Krimighna*	132	Synthesized Ag NPs silver nanao particles using root extract of *Erythrina indica* showed potent antibacterial activity against Gram positive and Gram negative bacteria and these biologically synthesized nanoparticles were also proved to exhibit excellent cytotoxic effect on breast and lung cancer cell lines[30].
3.	***Sigru***	*Moringa Oleifera*	Moringaceae	*Krimighna*	156	The antimicrobial activity of petroleum ether, chloroform, ethanol and aqueous extracts of *Moringa oleifera* leaf against four microorganisms viz., Escherichia coli, *Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae*. The antimicrobial activity was performed by Kirby-Bauer disc diffusion method. Ethanolic extract showed maximum zone of inhibition against Staphylococcus aureus[31].
4.	***Tulasi***	*Ocimum sanctum*	Lamiaceae	*Krimighna*	166	Broth micro-dilution method determined the minimum inhibitory concentration (MIC) of Toulsi

						essential oil against selected microbial pathogens. The oils, at concentrations of 4.5 and 2.25% completely inhibited the growth of *Staphylococcus aureus* (including MRSA) and *Escherichia coli*, while the same concentrations only partly inhibited the growth of *Pseudomonas aeruginosa*[32].
5.	***Vaca***	*Acorus calamus*	Araceae	*Krimighna*	169	Rhizomes ethyl acetate and ethanol extracts of *acorus calamus* exhibited pronounced antibacterial activity against MRSA with diameter zone of inhibition and antifungal activity against *Aspergillus niger* with diameter zone of inhibition[33].
	API-I, Volume-III,2001 IstEdition					
1.	***Amra***	*Mangifera indica*	Anacardiaceae	*Krimighna*	08	The in vitro antimicrobial activities of methanol and ethanol extracts of mango seed against 25 representatives gram positive, gram negative, acid fast bacteria and fungi. In most test strains comparable zones of inhibitions were noted for both methanol and ethanol extract. Candida albicans and *Aspergilllus niger* were both inhibited by the extracts[34].
2.	***Dhattura***	*Datura metel*	Solanaceae	*Krimighna*	44	Antimicrobial activity of aerial parts of *Datura metel* L were evaluated against the resistant pathogens belong to aquatic, human and plant origin by preparing extracts of hexane, chloroform and methanol.. Among all microorganisms studied *Erwinia caratovara* and *Pseudomonas syringae* showed the considerable growth inhibition with chloroform and methanolic extracts[35].
3.	***Eranda***	*Ricinu scommunis*	Euphorbiaceae	*Krimighna*	49	Methanol leaf extracts were found to be more active against Gram positive bacteria (*Bacillus subtilis* and *Staphylococcus aureus*) as well as Gram negative bacteria (*Pseudomonas aeruginosa* and *Klebsiella pneumoniae*) than ethanol and aqueous leaf extracts. Antifungal activity of methanol and aqueous leaf extracts were also carried out against selected fungal strains as *Aspergillus fumigatus* and *Aspergillus flavus*. Methanolic as well as aqueous leaf extracts of *Ricinus communis* were effective in inhibiting the fungal growth[36].
4.	***Indravaruni***	*Citrullus colocynthis*	Apocynaceae	*Krimighna*	66	*Citrullus colocynthis* showed broad spectrum antimicrobial activity against 16 clinical microorganisms isolated from HIV positive patients, including bacteria Viz., Bacillus subtilis, Escherichia coli, Klebseilla pneumoniae, Proteus mirabilis, Proteus vulgaris, Staphylococcus aureus, Streptococcus faecalis, Streptococcus pyogenes, Salmonella

						typhi and Vibrio cholerae; and six fungal strains Aspergillus flavus, Aspergillus fumigatus, Candida albicans, Mucor sp., Penicillium sp. and Rhizopus sp[37].
5.	***Kamala***	*Nelumbo nucifera*	Nymphaeaceae	*Krimighna*	82	*Nelumbo nucifera* leaf extracts were prepared using different solvents (hexane, acetone and methanol) and evaluated for antioxidant and antimicrobial activity. DPPH free radical scavenging activity was high in methanolic leaf extract of *N. nucifera* compared to other extracts[38].
6.	***Lasuna***	*Allium Sativum*	Liliaceae	*Jantunasnam*	109	The methanol and aqueous suspensions of the dried *Allium sativum* (Liliaceae) bulbs extract was screened for its antimicrobial activity using the agar-well diffusion method. It is tested against Gram-positive bacteria (Staphylococcus aureus). All suspensions showed an inhibitory effect against tested bacteria[39].
7.	***Manjistha***	*Rubia cordifolia*	Rubiaceae	*Krimighna*	113	*Rubia cordifolia* root methanol extract showed antibacterial activity against all the three Gram-positive bacteria used in this study and four Gram-negative bacteria and showed antifungal activity against Candida albicans. Interestingly *R. cordifolia* root methanol extract showed activity against 3 out of 4 bacteria which showed resistance to all antibiotics used in this study[40].
8.	***Marica***	*Piper nigrum*	Piperaceae	*Jantunasnam*	115	Piperine was evaluated for its antimicrobial activity against Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Escherichia coli, Alternaria alternata, Aspergillus niger, Aspergillus flavus and Fusarium oxysporum. The antibacterial activity was measured by agar well diffusion method and antifungal activity by poisoned food technique. Piperine showed antimicrobial activity against all tested bacteria Piperine showed maximum antifungal activity towards Fusarium oxysporum and very least effect against Aspergillus niger[41].
9.	***Nagarmotha***	*Cyperus rotundus*	Cyperaceae	*Krimighna*	129	The powdered rhizome extracts of *cyperus rotundus* were successively extracted with petroleum ether, chloroform, ethanol and water using Soxhlet apparatus. The antibacterial and antifungal activities were performed by both agar well diffusion and serial dilution methods. The ethanolic extract was found to exhibit highest activity against tested bacteria. However all extracts were ineffective against fungal strains[42].
10.	***Nichula***	*Barringtonia Acutangula*	Lecythidaceae	*Krimighna*	136	In vitro antibacterial activity of aqueous, ethanolic, petroleum ether and chloroform extracts against *Staphylococcus aureus, Pseudomonas*

						aeruginosa, Klebsiella pneumoniae, Enterococcus faecalis and *Escherichia coli* the major urinary tract infection causing pathogens were tested by disc diffusion assay method and the minimum inhibitory concentration was evaluated. Ethanol (95%) extract exhibited broader spectrum of inhibition followed by chloroform, petroleum ether and aqueous extracts against the urinary tract pathogens under test[43].
11.	***Nili***	*Indigofera Tinctoria*	Fabaceae	*Jantunasnam*	138	Time kill assay were analyzed for methanol extract of I.tinctoria and it showed bacteriostatic and nonmutagenic activity up to 5 mg per plate in Ames test both in the presence and absence of S9 fraction[44].
12.	***Parapunnada***	*Cassia Tora*	Fabaceae	*Krimighna*	153	Methanol and aqueous extracts showed significant antimicrobial activity against most of the tested microbes. The most susceptible microorganism was P. aeruginosa (19 mm zone of inhibition in aqueous extract) followed by Candida albicans[45].
13.	***Sthauneya***	*Taxus Baccata*	Taxaceae	*Jantunasnam*	203	The ethanolic extract of *Taxus baccata* heartwood showed significant activity against selected gram-negative bacteria and against five out of nine tested fungi[46].
14.	***Svetachandan***	*Santalum album*	Santalaceae	*Krimighna*	207	Antibacterial activity of Santalum album was performed with methanol solubility against various human pathogens viz. Bacillus subtilis (B.subtilis), Escherichia coli (E.coli), Staphylococcus aurous (S.aurous) and Pseudomonas aeuroginosia (P.aeuroginosia). The plant extracts showed better inhibitory activity against the tested organisms[47].
15.	***Tala***	*Borassus Flabellifera*	Araceae	*Krimighna*	211	The ethanolic extract of *Borassus Flabellifer* results showed that Bacillus anthracis was the most sensitive species, while Escherichia coli and Proteus mirabilis were more resistant than others. In the case of the methanolic extract, *Bordetella bronchiseptica* was the most sensitive and Proteus mirabilis and Arcanobacterium pyogenes were the most resistant species[48].
	API-I, Volume-IV First Edition Year 2004					
1.	***Kumkuma***	*Crocus sativus*	Iridaceae	*Jantunasnam*	52	Antimicrobial activity of different parts of *Croccus sativus L*, extracted by various solvents, were tested against different bacteria (*Microccucos luteus, Staphylococcus epidermitis, Staphylococcus aureus* and *E. coli*) and fungi (*Candida albicans, Aspergillus niger* and *Cladospourium sp*) by cup plate diffusion method. The results obtained show strong activity of the ethyl acetate extract of various plant parts of the plant (except leaves)

						against bacteria and fungi used as test organisms[49].
2.	***Rudraksa* (seed)**	*Elaeocarpus Sphaericus*	Elaeocarpaceae	*Krimighna*	104	Antibacterial activity of (PE), (BE), (CE), (AE) and (EE) extracts of dried *Elaeocarpus sphaericus* fruit was investigated against 28 gram-positive and gram-negative bacteria using the disc diffusion and plate dilution methods. The AE fraction showed marked antimicrobial activity against ten organisms. BE was active against Salmonella *typhimurium and Morganella morganii*, and EE against *Plesiomonas shigelloides, Shigella flexnerii* and *Sh. Sonneii*[50].
	API-I, Volume-V First Edition Year 2006					
1.	***Anisoon***	*Pimpinella Anisum*	Apiaceae	*Krimighna*	03	The extracts of *Pimpinella anisum* were tested in vitro against 4 bacterial species by the disc diffusion method. Staphylococcus aureus, Streptococcus pyogenes, Escherchia coli and Klebsiella Pneumoniae were used in this investigation. Only aqueous and 50% (v/v) methanol extract exhibited fair antibacterial activity against all the test bacteria[51].
2.	***Kakajangha* (seed)**	*Peristrophe Bicalyculata*	Acanthaceae	*Krimighna*	56	The results of the phytochemical screening revealed the presence of various secondary metabolites like steroids, alkaloids, phenols, flavonoids, saponins and tannins. Ethanolic extract of P. bicalyculata was most effective against E. coli, B. cereus and S. typhi. Highest zone of inhibition was observed against E. coli[52].
3.	***Kebuka***	*Costus Speciosus*	Zingiberaceae	*Krimighna*	74	The in vitro antibacterial activity was performed against a few pathogens showing positive results viz. E. coli, Staphylococcus aureus, Klebsiella pnuemoniae and Pseudomonas aeruginosa[53].
4.	***Nimba***	*Azadirachta indica*	Meliaceae	*Krimighna*	122	Antimicrobial activity in alcoholic extracts of *Neem* (Azadirachta indica) against E.coli, Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhimurium, Bacillus pumilus. When compared with gentamycin 200mg and gentamycin 10mg, the methanol and ethanol extract shows maximum inhibition on Bacillus pumillus, Pseudomonas aeruginosa and Staphylococcus aureus in an asending order[54].
5.	***Asmabhadhah***	*Aerva Lanata*	Amaranthaceae	*Krimighna*	132	The Antibacterial testing of stem extract *Aerva Lanata* was evaluated by Agar well diffusion method using gram positive bacteria like *Staphylococus aureus, Bacillus subtilius, gram negative bacteria like Escherichia coli, Klebseilia pneumoniae.* Ethyl acetate, Ethanol extracts of stem showed significant antibacterial activity compared with standard drug[55].

6.	***Putikaranj***	*Caesalpinia Crista*	Caesalpiniaceae	*Krimighna*	152	In vitro anthelmintic activity of crude aqueous methanolic extract of plants was determined using mature Haemonchus contortus and their eggs in adult motility assay and egg hatch test, respectively. In vivo, sheep was naturally infected with mixed species of gastrointestinal nematodes by administering crude powder(CP) and mehanolic extract in increasing doses. These data shows both *Caesalpinia crista* and *Chenopodium album* possess anthelmintic activity in vitro and in vivo[56].
7.	***Vanayajiraka***	*Centratherum Anthelminticum*	Asteraceae	*Jantunasnam*	191	The growth of E-coli, Pseudomonas aerugenosa the gram-negative bacteria and Fungus, have been inhibited by the chloroform extracts of the seeds of the Centratherum anthelminticum the extracts did not prevent the growth of the other test organism[57].
	API-I, Volume-VI First Edition Year 2009					
1.	***Asthisrnkhala***	*Cissus Quadrangularis*	Vitaceae	*Krimighna*	09	The in vitro antibacterial activity of different extracts of *Cissus quadrangularis* Linn (Vitaceae) against some Gram-negative and Gram-positive bacteria, were investigated. The methanol and ethyl acetate extract showed high activity against the bacteria tested[58].
2.	***Bhutakesi***	*Selimum Vaginatum*	Apisceae	*Krimighna*	12	Not available
3.	***Dvipantara-damanka***	*Artemisia Ansinthium*	Asteraceae	*Krimighna*	39	In this study the aggregate bactericide effect of four species (*Artemisia absinthium* L., *A. vulgaris* L., *Chrysanthemum leucanthemum* L. and *Achillea millefolium* L.) was screened using the *Vibrio fischeri* bioluminescence inhibition bioassay. The two *Artemisia* species which have well-established use as antibacterial, exerted the highest toxicity[59].
4.	***Haritamanjari***	*Acalypha Indica*	Euphorbiaceae	*Krimighna*	63	Antimicrobial activity of *Acalypha indica* was studied using different solvent like acetone and aqueous against bacterial strains like Staphylococcus aureus, Bacillus subtilis, Escherichia coli and Klebsiella sp. The acetone extract of *Acalypha indica* showed the maximum zone of inhibition against Staphylococcus aureus and Bacillus subtilis, minimum inhibition of Escherichia coli and Klebsiella sp[60].
5.	***Kitamari***	*Aristolochia Bracteolata*	Aristolochiaceae	*Krimighna*	88	Plant parts of Aristolochia bracteata Retz. were extracted with methanol, butanol, petroleum ether and aqueous extracts and tested against bacterial isolates isolated from clinical samples viz. Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa. The crude extracts showed significant broad spectrum antibacterial activity. Among four

						extracts assessed, methanol extract was found to have highest antibacterial activity followed by butanol extracts against certain bacterial isolates[61].
6.	***Sala***	*Shorea Robusta*	Dipterocarpaceae	*Krimighna*	137	Three solvent used for preparation of resin (Methanol, Ethanol and Toluene), methanol extraction of shorea showed highest response in term of sensitivity (high zone inhibition), while the least sensitivity was observed with toluene extract[62].
7.	***Sami***	*Prosopis Cineraria*	Leguminosae	*Krimighna*	142	Three parts of the plant *Prosopis cineraria* showed the inhibitory zone against the microorganisms. The highest zone of inhibition was showed by P. cineraria pods against *P. funiculosum* and by P. cineraria leaves against *S. griseus*[63].
8.	***Slesmataka***	*Cordia Dichotoma*	Boraginaceae	*Krimighna*	154	The antifungal activity of the extracts was carried out against three common pathogenic fungi (*Aspergillus niger, A.clavatus*, and *Candida albicans*). Zone of inhibition of extracts was compared with that of different standards like Amplicilline, Ciprofloxacin, Norfloxacin and Chloramphenicol for antibacterial activity and Nystain and Greseofulvin for antifungal activity. The extracts showed remarkable inhibition of zone of bacterial growth and fungal growth[64].
9.	***Valukasaka***	*Gisekia Pharnaceoides*	Aizoaceae	*Krimighna*	187	Chloroform, ethanol and aqueous extracts of leaves were evaluated against two Gram positive (*Staphylococcus aureus, Staphylococcus epidermidis*), two Gram negative (*Escherichia coli, Klebsiella pneumoniae*) bacterial strains and two fungal strains (*Aspergillus niger, Aspergillus fumigatus*) by agar disc diffusion method. Aqueous extract exhibited significant activity against the test organisms than the other two extracts[65].
10.	***Sarsapa Taila***	*Brassica Campestris*	Brassicaceae	*Krimighna*	220	The susceptibility of six microorganisms covering gram positive bacteria, gram negative bacteria and two fungi to the extracts and fractions of *Brassica Campestris* was measured using cut plug method and the results compared with standard antibiotic gentamycin and the standard antifungal fluconazole. All the tested fractions and crude extracts revealed positive inhibitory effects against *Candida albicans, Pseudomonas aeruginosa and Bacillus subtilis.* Light petroleum fraction of roots showed somewhat strong antifungal activity against Candida albicans[66].

CONCLUSION

The Main Objective of this review work conducted by authors To Compile the scattered references and to bring all medicinal plants having *Kriminghna* properties mentioned In Ayurvedic Pharmacopoeia Of India under one heading along with its secondary data available in the form of articles showing antimicrobial activity performed by taking extracts from herbs mentioned and analyzed by various methods through invitro and invivo analysis of individual herbs mentioned in the API. The compiled data will help upcoming research scholars, students, scientists and various stake holders in formulating combined neo formulations incorporating the single drugs mentioned having proven *Krimighna* activities by using methodology shown in the research leads. Scientific validation of neo formulation can be conducted by adopting the methods mentioned in the secondary data compiled and shown in research leads by the authors. The data compiled will help for analysis of the individual herbs having *Krimighna* properties and help for isolating the similar chemical constituents and active principles having antimicrobial property which in turn will contribute the Ayurvedic drug industry vastly.

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